

CHLOROPHYLL CONTENT IN CERTAIN CULTIVARS AND HYBRIDS OF COCONUT

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ABSTRACT

$N/2$ or $(N+1/2)$ leaf (where N is the total number of leaves) were determined to be the most representative one for chlorophyll estimations in coconut. Significant differences in the chlorophyll content were noted among the different varieties and hybrids of coconut. The two high yielding hybrids, viz., $T \times D$ and $D \times T$, possessed more chlorophyll than West Coast Tall, Dwarf Orange and Dwarf Green. Chlorophyll content was lowest in the Dwarf Orange variety.

CHLOROPHYLL among the plant pigments is unique in that it is one of the essential ingredients in photosynthesis and consequently in dry matter production. Wide variations in the chlorophyll content have been reported in different families and varieties of crop plants (Griffith *et al.*, 1944; Starnes and Hadley, 1965; Yadav and Mathai, 1972). The coconut palm exhibits wide variability in the growth habit, fruiting and vegetative characters, colour, shape and size of nuts, colour of the petiole, etc. Two distinct groups of coconut, viz., Tall and Dwarf, are recognised on the basis of the growth of the stem, age of fruiting, and the size of nuts. Within the Dwarf variety itself, different forms have been recognised on the basis of the colour characteristics. The Tall \times Dwarf hybrid and its reciprocal hybrid have been found to be promising with respect to the economic attributes. A study was undertaken to investigate the variation in the chlorophyll content in three different cultivars and two hybrids of coconut, viz., West Coast Tall, Chowghat Dwarf Orange, Dwarf Green, Tall \times Dwarf Orange, and Dwarf Orange \times Tall.

MATERIAL AND METHODS

To standardise the leaf sampling technique for determination of chlorophylls in coconut, representative samples were drawn from all the leaves of five adult coconut palms, having 30-35 leaves. The fronds were numbered from top

to bottom according to maturity, the youngest fully opened leaf being No. 1. Ten leaflets, five each from both sides of the middle portion of the rachis (midrib), were collected. From each leaflet (pinna) only the middle 15 cm portion was taken for analysis. Chlorophyll content in the leaf was determined, as per the method described by A.O.A.C. (1966). Fractions of chlorophyll were calculated from the absorption data using the equations of Comar and Zscheile (1942). The data indicated that the chlorophyll content is higher in the leaves of the middle whorl than that in the outer or inner whorls. In order to select a representative leaf from the middle whorl, another set of 5 palms were studied. In these, the leaves of the middle whorl only (Nos. 10-20) were selected for chlorophyll estimations. Subsequently, the chlorophyll content in the representative leaf samples drawn from 20 palms each of West Coast Tall, Chowghat Dwarf Orange, Chowghat Dwarf Green, Tall \times Dwarf and Dwarf \times Tall were determined. Yield data and the total number of leaves were also recorded for these palms.

RESULTS

Data on the mean chlorophyll content and the respective coefficient of variation of the ten palms studied are presented in Table I. The $N/2$ or $(N + 1/2)$ leaf in the crown (where N is the total number of leaves) was found to

TABLE I

Chlorophyll content in the leaves of the middle whorl of coconut (Mean of 10 adult palms)

Position of leaf	Mean chlorophyll content (mg/gm fresh weight)	Coefficient of variation (%)
10th	1.80	35.42
11th	1.85	35.21
12th	2.03	33.53
13th	2.12	35.37
14th	2.29	29.14
15th	2.27	20.42
16th	2.13	25.08
17th	2.06	22.14
18th	1.86	31.82
19th	1.86	33.18
20th	1.85	33.19
*N/2 or N+1/2	2.20	18.42

* N represents the total number of leaves.

be the most representative one for the estimation of chlorophyll content, as the mean chlorophyll content was fairly high and the coefficient of variation was the lowest in this leaf in relation to the total number of leaves.

The total chlorophyll content, chlorophyll *a*, chlorophyll *b*, number of leaves, average annual yield for the previous five years of the cultivars and hybrids studied, together with the results of the statistical analysis are given in Table II. As in the case of other characters, significant differences in the chlorophyll content were noted between the varieties studied. Both the hybrids Tall × Dwarf and Dwarf × Tall contained more chlorophyll than the varieties. The lowest amount of chlorophyll was observed in the Dwarf Orange variety.

DISCUSSION

Differences in the chlorophyll content among different varieties have been reported by Griffith *et al.* (1944) in tobacco, Starnes and Hadley (1965) in soyabean, and Yadav and Mathai (1972) in arecanut. In the case of coconut, the two hybrids show hybrid vigour for yield and the total chlorophyll content as well as chlorophylls *a* and *b* in the hybrids are more than those of either parents. Black and Mayne (1970) reported that the plants, having

TABLE II

Chlorophyll content, number of leaves, and mean yield in different varieties/hybrids of coconut

Varieties/hybrids	Total chlorophyll		Chlorophyll <i>a</i>		Chlorophyll <i>b</i>		Chlorophyll <i>a/b</i> ratio	No. of leaves	Mean yield	
	mg/gm fresh wt.	mg/cm ²	mg/gm	mg/cm ²	mg/gm	mg/cm ²			No. of nuts	Annual outturn of copra per palm (in kg)
West Coast Tall	1.73	0.068	0.99	0.039	0.74	0.028	1.31	25	60	10.59
Dwarf Green	1.83	0.059	1.01	0.033	0.82	0.026	1.25	29	68	3.84
Dwarf Orange	0.93	0.030	0.51	0.016	0.42	0.013	1.19	25	39	6.19
Tall × Dwarf	2.10	0.081	1.18	0.046	0.92	0.035	1.31	34	86	15.30
Dwarf × Tall (Natural)	2.22	0.08	1.23	0.044	0.99	0.036	1.24	28	73	15.31
CD at 5%	0.1869	0.0074	0.1069	0.0040	0.0938	0.0034	0.0705	2.0334	16.8311	3.21

C₄ dicarboxylic acid cycle of photosynthetic system, have a high content of chlorophyll, especially of chlorophyll *a*. A highly efficient photosynthetic mechanism and consequent dry matter production is known to exist in such plants. Gabrielsen (1948) also reported a positive correlation between chlorophyll content and photosynthetic efficiency in different species of plants. While in coconut detailed studies on the photosynthetic rates of different varieties are under way, it may be observed that the higher chlorophyll content noted in the leaves of certain cultivars is, perhaps, indicative of the capacity for high rates of dry matter production.

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DISCUSSION

NAMPOOTHIRI: The conclusions are based on comparison of means. I suggest that the correlation between the chlorophyll and the yield and yield attributes will be more informative.

MATHEW: Yes, experiments on this line have already been initiated.